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## Assessment of a Synchrotron X-ray Method for Quantitative Analysis of Calcium Hydroxide in Cementitious Systems

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Beamline(s): X14A

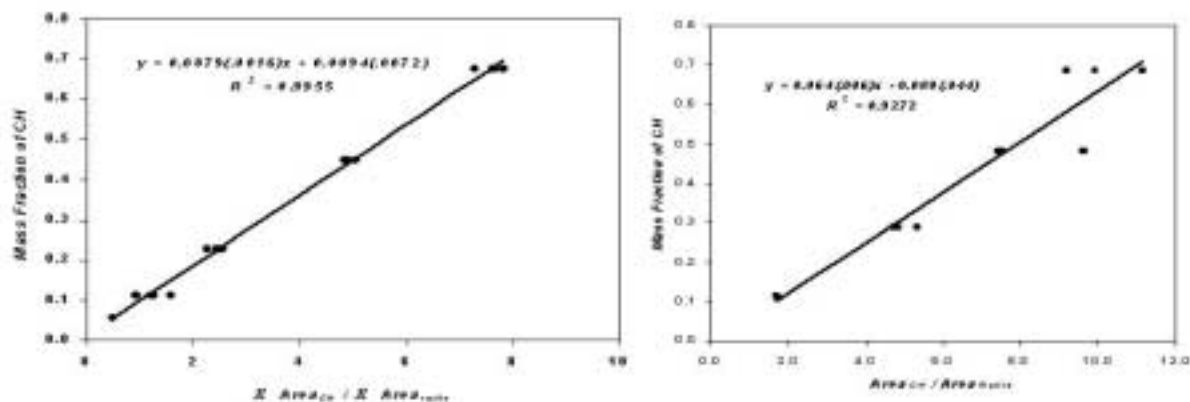
**Introduction:** Thermogravimetric analysis (TGA) and quantitative x-ray diffraction (QXRD) are widely used to determine the calcium hydroxide content in cementitious blends of portland cement, fly ash, blast furnace slag, silica fume and other cementitious and pozzolanic materials. These techniques, however, are destructive and subject to various forms of error. While precise weight losses can be measured by TGA, extracting data for convoluted multiple processes is difficult. And, while conventional x-ray QXRD offers easier de-convolution, the accuracy for components below about 5 % is poor.

**Methods and Materials:** Synchrotron x-ray diffraction was used to develop calibration data for quantification of the amount of calcium hydroxide (CH) in mixtures with fly ash. The method was compared to conventional laboratory x-ray diffraction using copper K $\alpha$  radiation and to TGA.

**Results:** Figure 1 is a comparison of calibration data for the conventional and synchrotron methods.

**Conclusions:** While all three methods used offer good quantification, synchrotron x-ray diffraction was found to provide a broader range of detectability than laboratory diffraction, removes the subjectivity as compared to TGA analysis and provides a sealed, in situ environment for tracking individual specimens over the course of the entire hydration history.

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**Figure 1.** (a) Calibration using conventional x-ray diffraction, (b) calibration using synchrotron x-rays